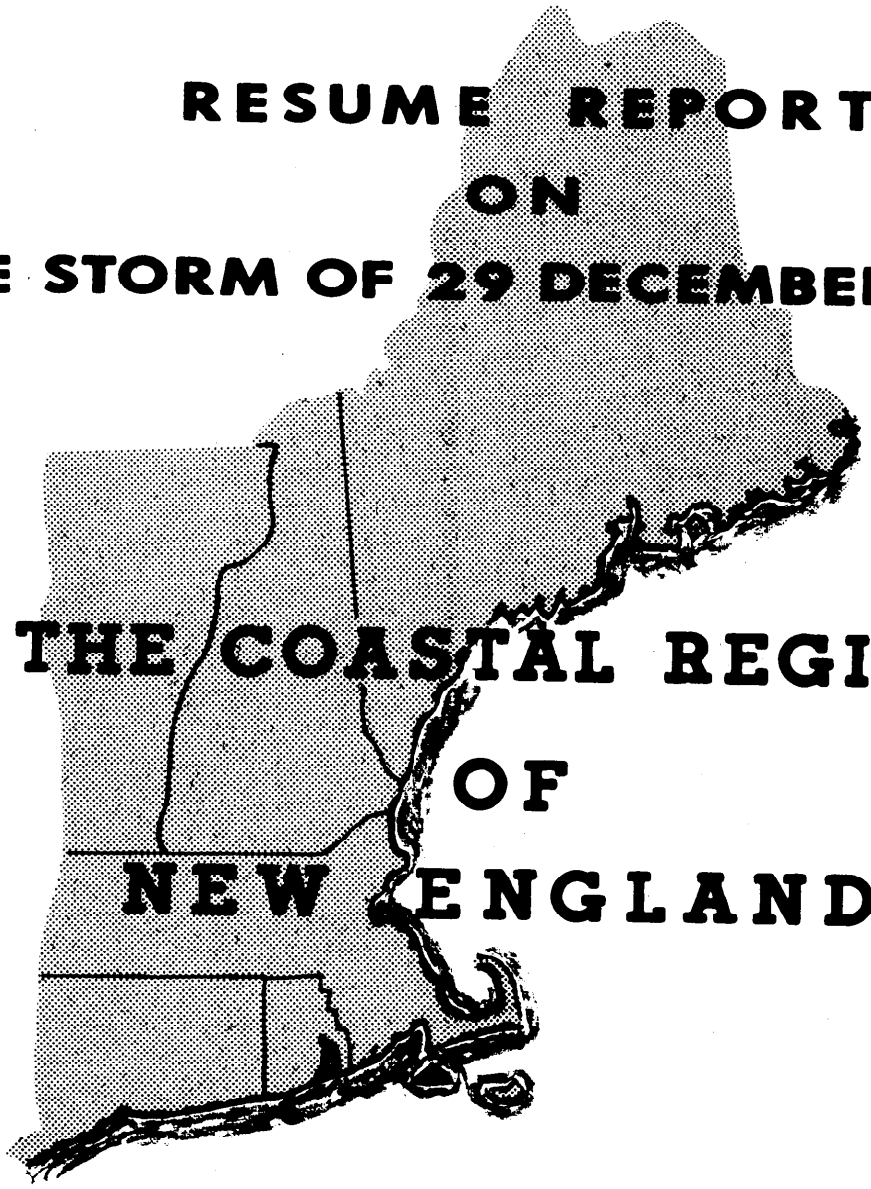
RESUME REPORT ON THE STORM OF 29 DECEMBER 1959



THE COASTAL REGION OF NEW ENGLAND

U.S. Army Engineer Division, New England
Corps of Engineers
Boston, Mass.

19 FEBRUARY 1960

RESUME REPORT ON THE STORM OF 29 DECEMBER 1959

IN THE

COASTAL REGION OF NEW ENGLAND

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BOSTON, MASSACHUSETTS. "T" Wharf.
Photo by The Christian Science Publishing Society.

HULL, MASSACHUSETTS. Gun Rock section.
Photo by Quincy Patriot Ledger.

RESUME REPORT ON THE STORM OF 29 DECEMBER 1959

IN THE

COASTAL REGION OF NEW ENGLAND

SUMMARY

On 29 December 1959 a northeast storm off the New England coast caused damages of about $6,200,000 from tidal flooding near Boston, Massachusetts, and in other areas north of Cape Cod along the Massachusetts, New Hampshire and Maine coasts. Only minor damages occurred south of Cape Cod. By states, the estimated damages were:

Massachusetts	$5,300,000
Maine	800,000
New Hampshire	100,000
Total	$6,200,000

The recorded high water level of 14.2 feet above mean low water at Boston was about 4.7 feet above the ordinary high water level, and 2.3 feet above the predicted spring high water for 29 December. This is the highest elevation at Boston since December 1909, when a level of 14.9 feet was recorded.

On-shore winds combined with high spring tides to produce the unusually high water levels which inundated low shore front areas. A general eastward movement of the storm caused the winds to moderate before the time of high tide so that wave action was not severe. The storm was typical of the "northeasters" which occur more frequently than hurricanes. In the period from December 1957 through April 1958

18 damaging storms were reported. One of the heaviest northeasters in recent years occurred in November 1950 when estimated damages were $15,000,000, including severe damage on the Connecticut shore.

The damages in the 29 December storm were more from flood waters and less from wave action than in the usual "three day northeaster." Tidal flood damage was most serious at Hull, Revere, Quincy and Boston, in Massachusetts, and Biddeford, Saco and Portland, in Maine.

Of more than 2,000 homes flooded in Massachusetts, 1,000 were in Hull, Revere and Quincy. In Boston, important wharf areas were flooded up to 3 feet in depth, and water reached the level of a Metropolitan Transit Authority subway entrance where it slopped over the sill into the tunnel. Most of the larger commercial buildings in the flooded areas were able to control basement flooding by means of pumps.

Because of the moderate wave action many beaches showed little erosion and were in good condition after the storm and exposed coastal areas which normally take the brunt of storm attack suffered little damage. Strong winds or higher flood levels would have increased the damages rapidly.

The problems of emergency measures based on storm warnings or permanent protection by breakwaters, seawalls and dikes, raising of beaches and lifting floor levels are becoming increasingly important to the State and local people.

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INTRODUCTION

1. Purpose. - This report is prepared in accordance with paragraph 81.40, EM 500-1-1 of the Corps of Engineers, U. S. Army, dated 3 June 1957 pertaining to Post Flood Reports, Emergency Flood Control activities under Public Law 99, 84th Congress. It presents a general description of the 29 December 1959 storm and the effects of tidal flooding and wave action on shore structures and protective installations, beaches, private properties, highways and utilities.

2. Scope. - Storm damage information for the report was obtained from field inspections immediately after the storm, contacts with local people, and newspaper accounts. Estimates of damage are approximate for some areas. The report covers only the coastal region of New England within the limits of the New England Division area, which extends along the shore to the Connecticut-New York State line.

3. Acknowledgements. - Grateful acknowledgement is made to officials of the states, cities and towns, and many other individuals and agencies for their assistance and cooperation in furnishing information. These include the Boston Globe, the Boston Record American, the Boston Herald Traveler, the Christian Science Publishing Society, the Quincy Patriot Ledger, and the Portland Press Herald, for the use of their photographs in this report. Considerable data was furnished also by the United States Weather Bureau and the Coast and Geodetic Survey, Department of Commerce.

THE STORM

4. General. - A low pressure area was centered over Chesapeake Bay at 0100 on the morning of 29 December 1959 with a cold front extending southerly along the coast through Hatteras and curving to the west, crossing the southern tip of Florida. A stationary front extended northeasterly from the center of the low and curved to the east extending south of Nantucket. By 1300 on the 29th, the low pressure center had moved east-northeasterly and was located almost directly east of Boston, Massachusetts, and south of Yarmouth, Nova Scotia.

5. Winds. - The winds associated with the storm were from the east-northeast with velocities from 25 to 35 miles per hour. The winds, although not unusually strong persisted in a direction normal to the New England shore from Cape Cod, Massachusetts, to Portland, Maine during the period of the incoming tide. This wind pattern prevailed over the whole area of the ocean north of the stationary front resulting in a fetch of over 300 miles.

6. Tides. - The relative positions of the sun, the moon, and the earth were such as to produce very high spring tides at the time of the storm. New moon occurred at 1409 Eastern Standard Time on the 29th and the moon was in perigee at 2000 Eastern Standard Time on 28 December 1959, a combination that causes the maximum astronomical tides.

The steady easterly wind at the time of normal incoming tide acted to raise the tide height approximately 1.5 to 2.5 feet above the predicted height along the New England coast. Observed maximum tide heights on 29 December from U. S. Coast and Geodetic Survey standard tide gages are

tabulated below together with the predicted normal tide. The previous observed maximum heights at these gages are also tabulated with the dates of their occurrences.

Location and Period of Record	Maximum Height in Feet Above Mean Low Water			
	29 December 1959		Previous Recorded	
	Observed	Predicted	Maximum Height	Date
Eastport, Maine (1929 to date)	22.9	21.5	23.2	11/20/45
Bar Harbor, Maine (8/16/47 to date)	15.0	12.6	14.4	2/15/53
Portland, Maine (3/4/10 to date)	13.0	11.1	13.2	11/30/44 11/20/45
Portsmouth (Seavey Island, Maine) (8/24/26 to date)	12.0	10.3	12.0	11/30/44
Boston, Massachusetts (5/3/21 to date)	14.2	11.9	13.8	4/21/40
Cape Cod Canal, (East Entrance) Massachusetts (5/55 to date)	13.2	11.1	No significant maximum	

7. Waves. - Since the storm moved rapidly eastward during the time of the incoming tide the wind along the shore had moderated by the time of high tide. The wave action, therefore, was not particularly severe, being mainly in the form of long decaying waves. In the lee of any obstruction from the waves coming in from the open ocean the water was practically calm. For example, Boston Harbor was described as, "calm as a mill pond," at the time of high water.

8. Other Storms. - Storms in the past have caused exceptionally high tides along the New England coast. A storm on February 24, 1722 is reported to have caused a tide height at Boston of about 15.4 feet above mean low water. Dates of other storms with the maximum tide heights in feet above mean low water at Boston are:

April 16, 1851, Lighthouse Storm	14.9 feet
November 27, 1898, Portland Gale	14.4 feet
December 26, 1909, Christmas Gale	14.9 feet
April 22, 1940	13.8 feet

Many northeast storms occurring at times of lower tidal elevation have caused extensive damage to shore structures due to violent wave action. The coast of Rhode Island and Connecticut are subject to damage by storms with southerly winds.

STORM DAMAGES

9. General Description. - The $6,200,000 storm damage was largely due to tidal flooding with the highest water levels reported since 1909. Wave action was not unusually severe. About 85 percent of the damages occurred in areas near Boston, Massachusetts, where thousands of people were made temporarily homeless, and a number of residences and commercial establishments were damaged. In some areas flooding occurred from back-up of sewers, causing health and pollution problems. Many automobiles were damaged or destroyed. Power and communication lines were damaged throughout the area.

Other areas from Cape Cod, north, suffered varying degrees of damage. South of Cape Cod, the shore lines of Massachusetts, Rhode Island and Connecticut suffered little more than minor flooding from the 29 December 1959 storm, although tidal flood and wave damages are reported which are attributable to other storms of this winter.

No deaths were reported as the direct result of tidal flooding or wave action. The storm damages are described below for the more severely affected cities and towns in the States of Massachusetts, New Hampshire and Maine.

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STORM DAMAGE IN MASSACHUSETTS

10. General. - The hardest hit area along the Massachusetts coast was in the Boston area from Hull to Lynn with varying degrees of damage from Cape Cod north. The greatest amount of damage was caused by flooding of homes and industries and by erosion of some of the beaches within the area. The total damage for Massachusetts amounted to $5,300,000

Brief descriptions of the nature of the shore damages from Cape Cod north with approximate estimates of losses are included in the following paragraphs. The accompanying map gives the principal locations where damage occurred.

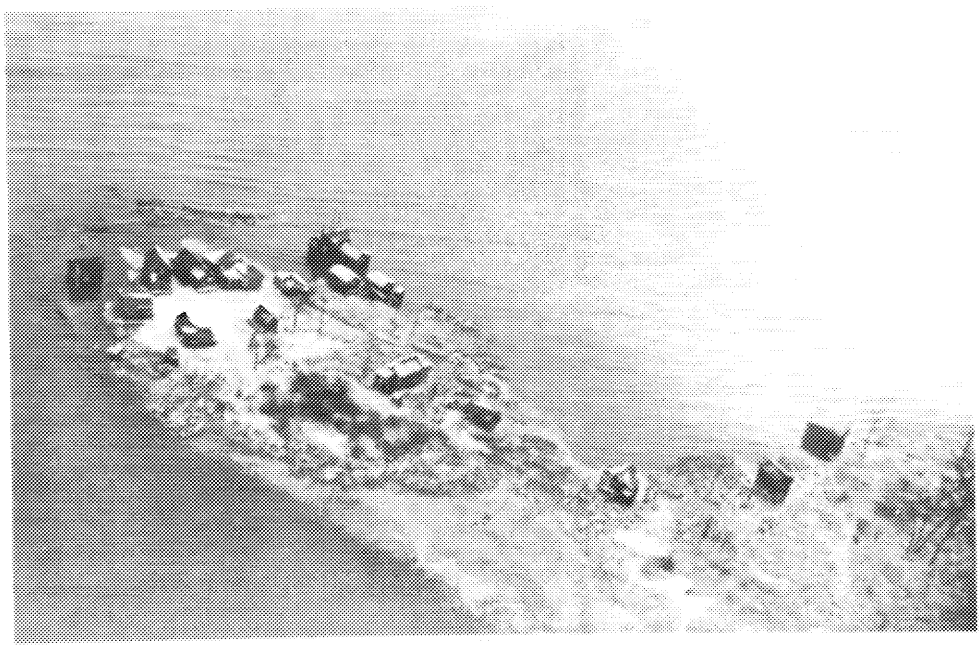
11. Cape Cod, Massachusetts. - The two major damage sectors on Cape Cod were at Provincetown, with some 65 residential and 20 commercial properties affected, and at Barnstable with 13 residences affected. Damages were attributed to wave action, flooding, or both. U. S. Route 6 and 6A were flooded in several areas along the north shore of the Cape. Additional damages consisted of erosion to shore front and highway embankments throughout the area.

Damages are estimated at $100,000.

12. Plymouth, Massachusetts. - A 75-foot length of sea wall was destroyed and low lying roads were flooded, depositing a small amount of sand, gravel and debris. No flooding of homes or industries were reported.

Damages are estimated at $20,000.

SCITUATE, MASSACHUSETTS. North Scituate Beach isolated as high tides flood causeway.
Photo by Boston Herald Traveler.



SCITUATE, MASSACHUSETTS. Low lying points of land were flooded, marooning many homes.
Photo by Boston Herald Traveler.

SCITUATE, MASSACHUSETTS. High tides flood Cedar Point.
Photo by Boston Herald Traveler.

SCITUATE, MASSACHUSETTS. Town Way on Peggoty Beach littered with shingle.
Photo by Boston Herald Traveler.

13. Duxbury, Massachusetts. - About 36 dwellings, mostly summer cottages located along the north portion of Duxbury Bay, experienced minor damage from flooding. Some sand loss along Duxbury beach resulted from wave action coincident with a high still water level.

Damages are estimated at $25,000.

14. Marshfield, Massachusetts. - About 150 houses, mostly summer cottages at widely scattered locations, were damaged by flooding at Marshfield. Approximately 20 stores sustained minor damage from back-up of the Green Harbor River. Riprap along Ocean Bluff was damaged by wave action.

Damages are estimated at $110,000.

15. Scituate, Massachusetts. - Extensive flood and wave damages were experienced along the entire Scituate coastline. About 230 dwellings, mostly summer cottages, were flooded at Minot, North Scituate Beach, Egypt Beach, Sandhills, Lighthouse Point, Scituate Harbor, Peggoty Beach and Fourth Cliff. About 25 families were evacuated from flooded areas.

About 400 feet of old sea wall at Lighthouse Point was destroyed. Sand, gravel, and debris were deposited on roadways in depths up to 4 feet and some shore roads suffered erosion. Storm drains and sanitary sewer systems were also reported as slightly damaged.

Damages are estimated at $290,000.

16. Cohasset, Massachusetts. - About 10 houses received minor damages from flooding. Sand, gravel and debris were deposited on low lying shore roads.

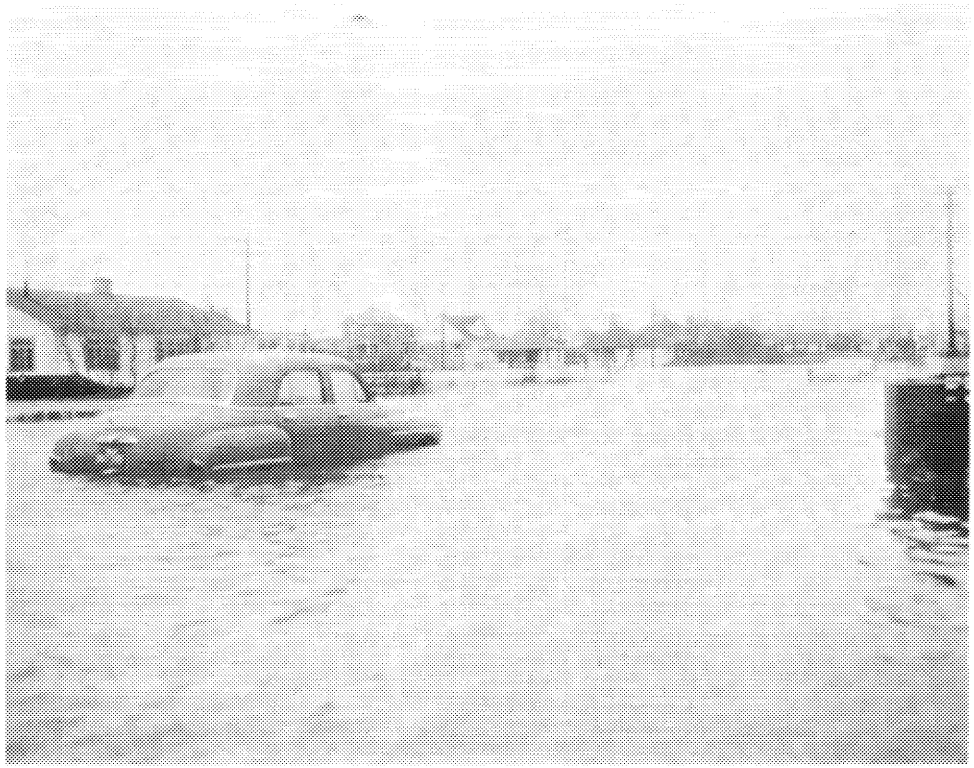
Damages are estimated at $5,000.

17. Hull, Massachusetts. - Severe flood damages occurred in the Kenberma section of Hull where about 350 houses and 50 automobiles were flooded up to depths of 6 feet. Water entered the area by seepage and overtopping of the sea wall along Newport Road on the bay side of the peninsula. This water was trapped when the tide fell causing a flood period of about 3 days. Drainage of the flooded area was finally accomplished by breaching the Newport Road sea wall for gravity drainage, supplemented by pumping.

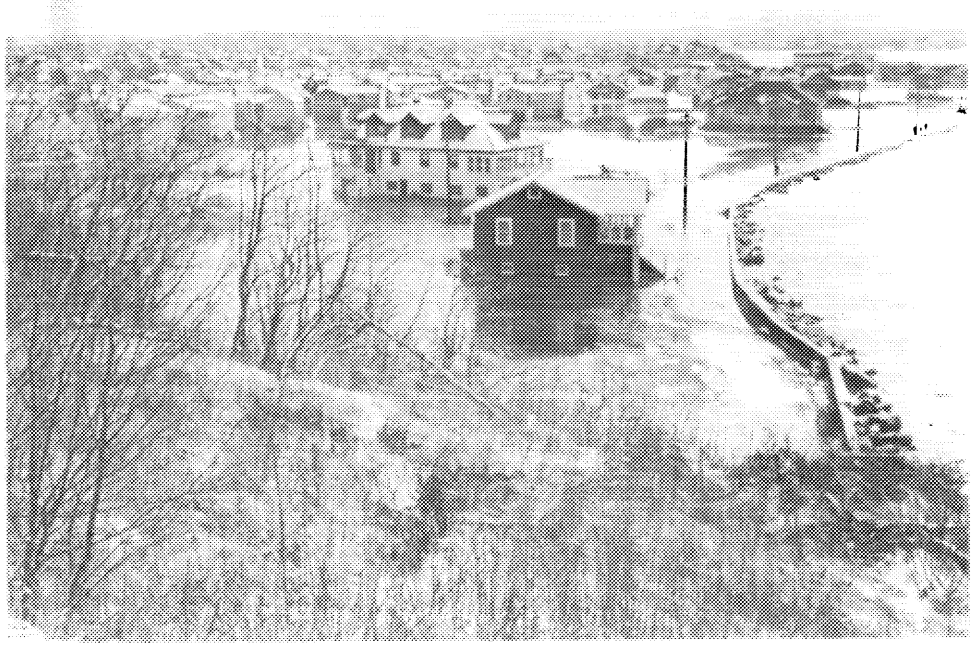
About 40 houses on Pemberton Point were flooded to depths of about 3 feet by overtopping of Channel Street Extension. Overtopping of the Metropolitan District Commission sea wall along Nantucket Avenue caused minor damage to about 20 commercial buildings. Sea walls along the east shore were damaged in two places from wave action. Beaches suffered minor sand losses. According to town officials, this is a common winter occurrence. Approximately 250 families were evacuated from the flooded areas. Federal and State agencies and the adjacent municipalities contributed emergency aid to the stricken areas.

Damages are estimated at $930,000.

HULL, MASSACHUSETTS. High tides left flooded streets lined with evacuated homes.
Photo by Boston Globe.



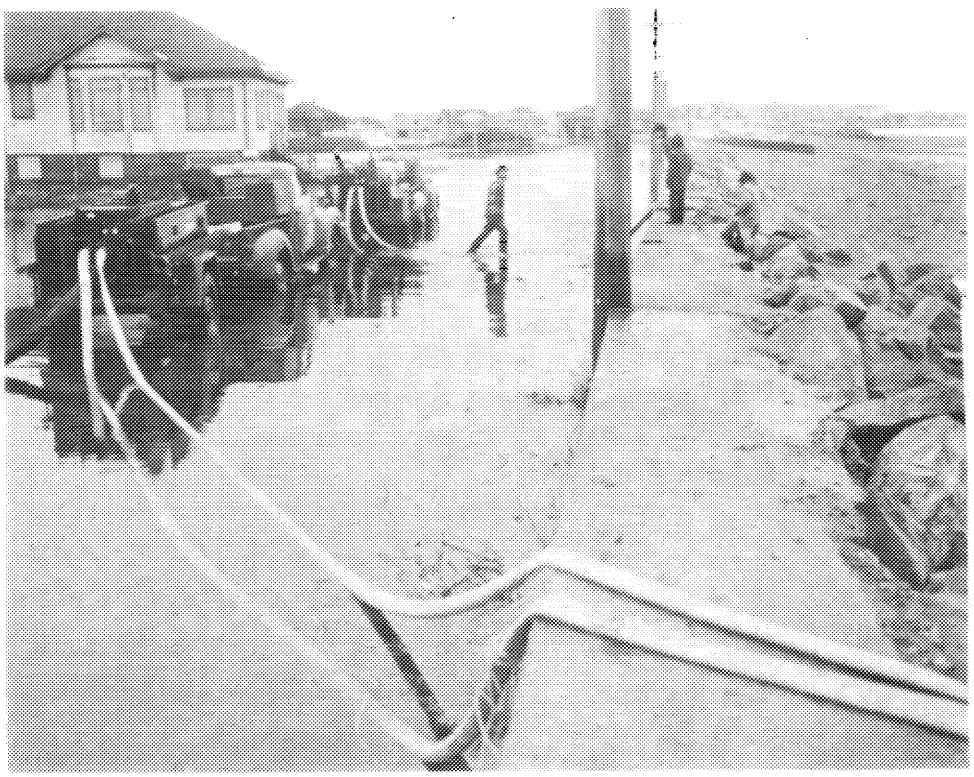
HULL, MASSACHUSETTS. Flooding trapped many automobiles throughout the Kenberma area.
Photo by Boston Record American.



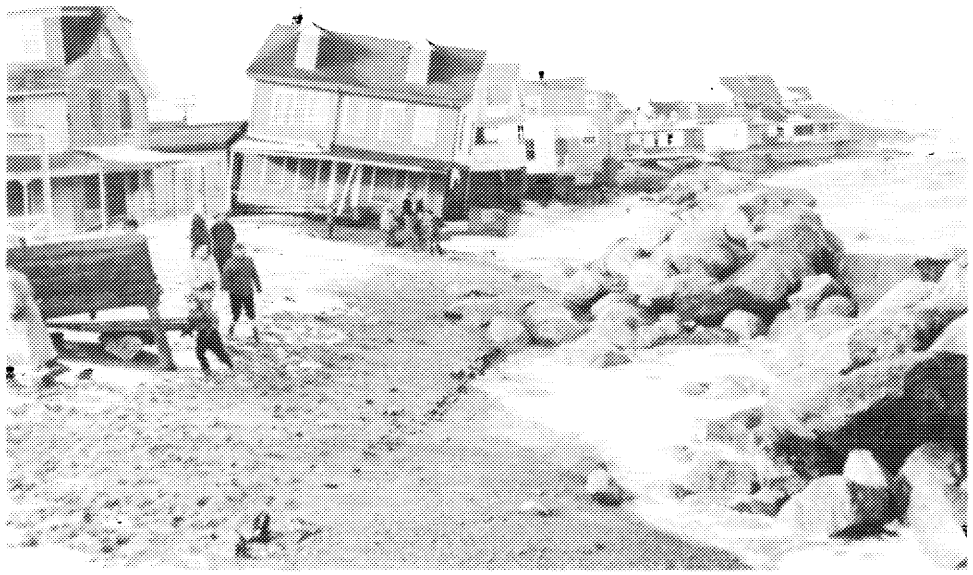
HULL, MASSACHUSETTS. Flood waters were trapped behind sea wall after the storm.

HULL, MASSACHUSETTS. Seawall and highway, at Kenberma, cut to drain area. *Photo by Boston Herald Traveler.*

HULL, MASSACHUSETTS. Street erosion.
Photo by Boston Herald Traveler.



HULL, MASSACHUSETTS. Pumping operation after the storm.
Photo by Boston Herald Traveler.



HULL, MASSACHUSETTS. Shore front damage in the Gun Rock section. *Photo by Boston Record American.*

HULL, MASSACHUSETTS. Shore properties damaged by waves, flooding and undermining.
Photo by Boston Record American.

HULL, MASSACHUSETTS. Kenberma section flooded. Hundreds evacuated. *Photo by Boston Herald Traveler.*

HULL, MASSACHUSETTS. Kenberma section. Water remained in area for three days.
Photo by Boston Herald Traveler.

18. Hingham, Massachusetts. - Some flooding in the West Corners area was reported for Hingham. There was a small amount of sand, gravel and debris on low lying shore roads.

Damages are estimated at $5,000.

19. Weymouth, Massachusetts. - About 15 summer cottages and 15 year-round dwellings were flooded, mostly along the Weymouth Fore River. In the commercial district at Weymouth Landing, about 10 stores experienced minor flooding of basements. Basement seepage is common in this area.

Damages are estimated at $70,000.

20. Braintree, Massachusetts. - Total damage consisted of basement seepage in about 4 houses and flooding of a parking lot.

Damages are estimated at $1,000.

21. Quincy, Massachusetts. - About 310 homes, two commercial buildings, an elementary school, 5 roads and 10 boats were damaged by flooding. Portions of the Squantum Naval Airfield were flooded up to 2 feet in depth. Squantum was isolated during the storm by overtopping of Squantum Street. About 40 homes were flooded in this area.

The periphery roads on Hough's Neck were overtopped in about 8 locations which resulted in flooding of about 190 houses.

Other damages in Quincy were widely scattered and resulted mainly from back-up of tidal inlets and storm sewers.

Damages are estimated at $750,000.

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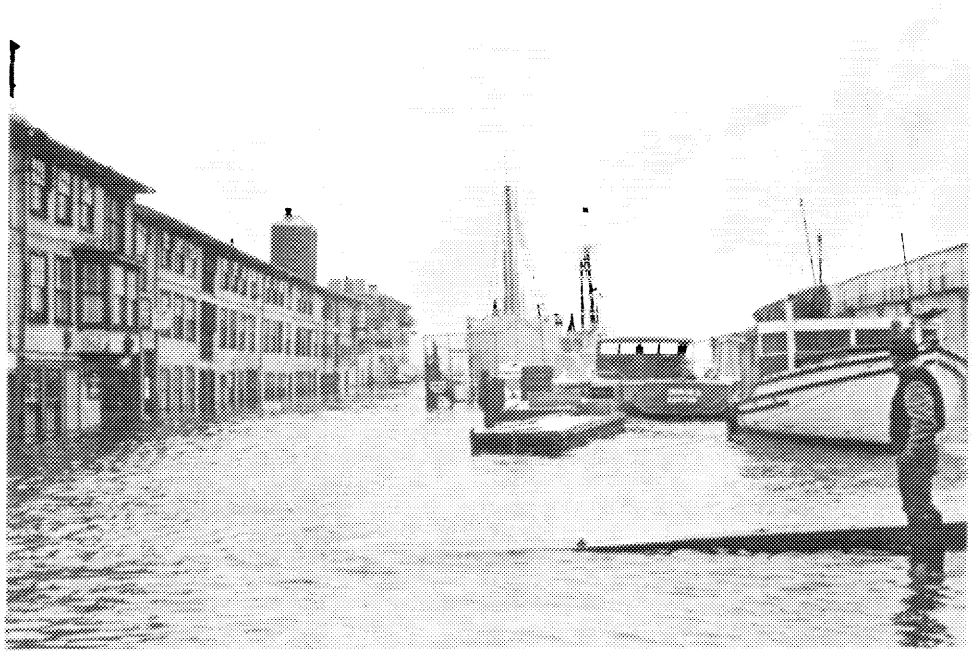
BOSTON, MASSACHUSETTS. High tides inundate wharf area along Atlantic Avenue.

Photo by Boston Record American.



BOSTON, MASSACHUSETTS. "T" Wharf area flooded to depths of from 2 to 4 feet.

Photo by Boston Record American.

22. Boston, Massachusetts. - Wharves along the waterfront, particularly in the Atlantic Avenue and Northern Avenue areas, were flooded to depths varying from a few inches to 2 or 3 feet. Streets in the wharf area were flooded making dockside facilities inaccessible. Water overflowed the foot of State Street and the entrance to the subway station was awash. A large number of buildings were in the flooded sector, but damage was kept to a minimum by use of sump pumps in basements. A portion of street flooding was attributed to the sewer lines backing up. Incoming tides trapped hundreds of motor vehicles on wharves, in parking lots, and on city streets. Extensive power and telephone interruptions occurred along the flooded area.

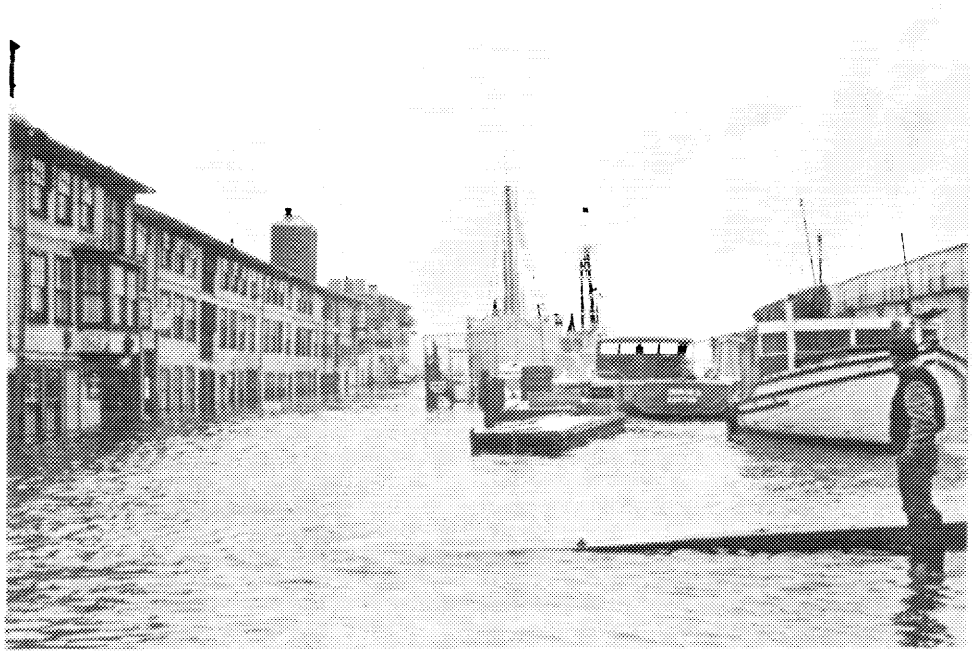
The Beach area, approximately 10 miles in length, extending from the Neponset River to Castle Island, lost considerable amounts of sand. Metropolitan District Commission beach shelters, fences and revetments suffered damages due to wave action. Portions of the William T. Morrisey Boulevard were flooded.

The lack of high winds and severe wave action are the chief factors that minimized the damages for the Boston area. A slight increase in flooding would have caused major damage throughout the city as pumping facilities would have been inadequate to handle a flood stage above that which occurred.

Damages are estimated at $1,000,000.

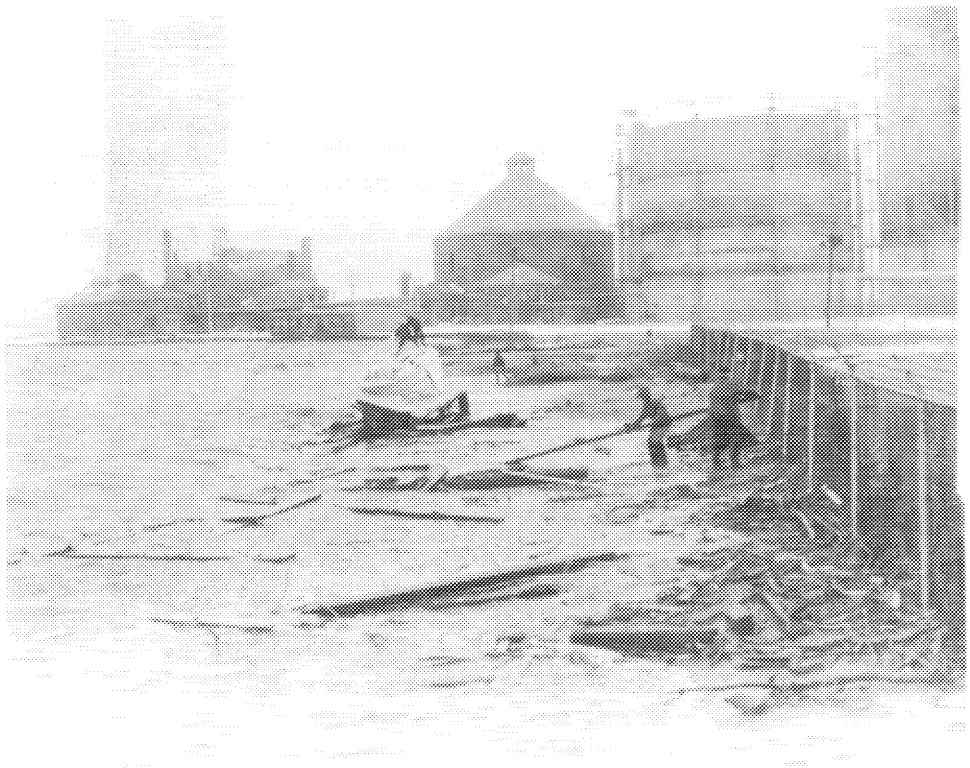
BOSTON, MASSACHUSETTS. High tides inundate wharf area along Atlantic Avenue.

Photo by Boston Record American.



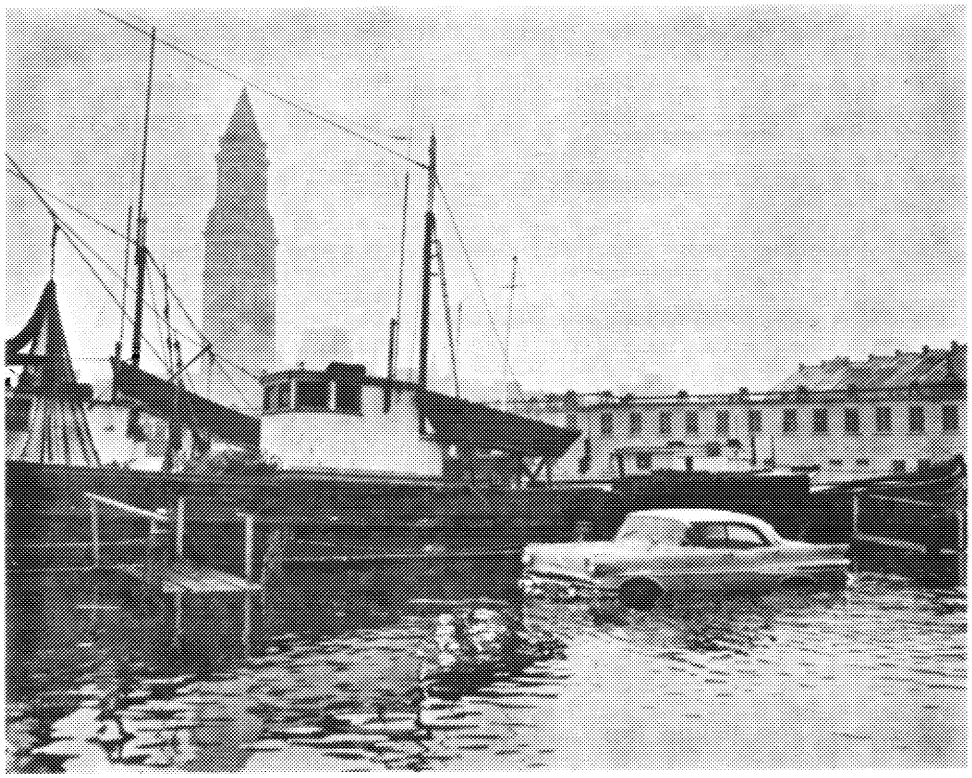
BOSTON, MASSACHUSETTS. "T" Wharf area flooded to depths of from 2 to 4 feet.

Photo by Boston Record American.



BOSTON, MASSACHUSETTS. Waterfront littered with debris after the storm. *Photo by Boston Record American.*

BOSTON, MASSACHUSETTS. Hundreds of motor vehicles were trapped by high tides along waterfront.
Photo by Boston Record American.



BOSTON, MASSACHUSETTS. Lack of wave action minimized damage to boats. *Photo by Boston Record American.*

BOSTON, MASSACHUSETTS. High tides flood Atlantic Avenue. *Photo by Boston Record American.*

23. Chelsea, Massachusetts. - A small amount of waterfront property along the Chelsea River, and Eastern Avenue in that vicinity, was flooded. Several basements were flooded.

Damages are estimated at $10,000.

24. Winthrop, Massachusetts. - Wave action displaced blocks forming the top of sea wall and overtopped the wall causing heavy deposits of sand, gravel and debris and flooding up to 3 or 4 feet in low lying areas. At least 160 homes and commercial establishments were flooded. Substantial beach erosion occurred along Yirrell Beach and Nerious Street.

Damages are estimated at $250,000.

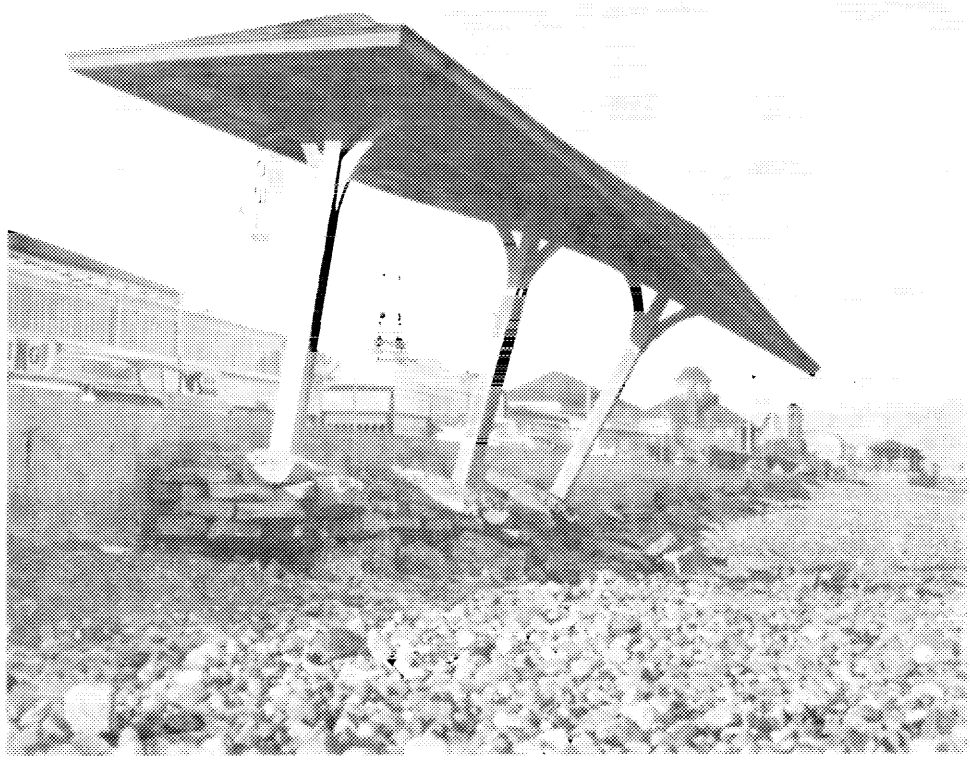
25. Revere, Massachusetts. - There was extensive damage at Revere Beach, with considerable loss of sand and undermining along a long-stepped sea wall due to heavy wave action. Major damage occurred at Roughan's Point (45 homes, Point of Pines (120 homes), and the Mill Avenue area (30 homes), and to commercial establishments due to overtopping of beaches and walls and flooding through low spots.

Minor damage resulted to public property, utilities and transportation facilities.

Damages are estimated at $1,000,000.

(a) Camping Area (1.) Both trailer and tent campsites could

WINTHROP, MASSACHUSETTS. High tides and heavy seas flow over the sea wall along the waterfront.
Photo by Boston Herald Traveler.



REVERE, MASSACHUSETTS. Storm waters removed sand from the beach, exposing foundations of 15 beach shelters.

26. Saugus, Massachusetts. - Flooding in the Saugus River area caused the evacuation of some 100 families. A state of emergency was declared. Highways were flooded and considerable debris had to be removed from the streets.

Damages are estimated at $100,000.

27. Lynn, Massachusetts. - Several multi-unit apartment buildings suffered extensive damages due to flooding caused by overtopping of the ocean sea walls and tidal flooding from Lynn Harbor. About 50 dwellings in the River Street and Camden Street areas experienced cellar damage.

Lynn Beach was seriously eroded along the entire length of Lynn Shore Drive.

Damages are estimated at $200,000.

28. Nahant, Massachusetts. - Thirteen occupied homes and six uninhabited summer residences (summer cottages) on Willow Road were flooded by high water and waves which overtopped an eight-foot high sea wall between Ocean Street and the Bass Point Nike Site.

This town was isolated for three hours due to the causeway being under several feet of water. The road was left with heavy deposits of driftwood, sand, rocks and debris.

Damages are estimated at $100,000.

SAUGUS, MASSACHUSETTS. Fire Department rescues many from flooded homes and stalled automobiles.
Photo by Boston Record American.

LYNN, MASSACHUSETTS. Sea wall and stairway damage threaten Lynn Shore Drive.

29. Swampscott, Massachusetts. - The beaches and shore structures throughout the area suffered little or no damage. Highways along the shore area were littered with small amounts of debris.

Damages are estimated at $5,000.

30. Marblehead, Massachusetts. - Wave action caused structural damage to several commercial and residential properties. State Wharf, sea walls and highways were overtopped with little or no damage. Debris littered the shore roads.

Damages are estimated at $50,000.

31. Salem, Massachusetts. - Flooding occurred in the Pequot Center area causing industrial plants to move stock and sandbag entrances to buildings. The Signal Manufacturing Company reported overtopping of a sea wall with flooding of their basement causing some loss of stock. Their plant was closed down for a week during a period of low production.

High tides and sewer back-up caused minor flooding in town streets. There were no reports of cellar flooding.

Damages are estimated at $100,000.

32. Gloucester, Massachusetts. - Very little damage occurred in Gloucester. Minor flooding to waterfront properties and low lying coastal roads with light deposits of sand, gravel and debris.

Damages are estimated at $10,000.

[illegible] facilities at the reservoir area will supplement these

33. Newburyport, Massachusetts. - The area between Newburyport and Plum Island was inundated to depths ranging from 2 to 3 feet. Water was above the first floors of 18 residences in the Plum Bush and Old Point Road areas. Flooding isolated Plum Island from the mainland. Sand, in depths of from 3 to 4 feet, drifted over some of the roads on the island. Wave action caused damage to the dock at the Coast Guard Station.

Damages are estimated at $15,000.

34. Salisbury, Massachusetts. - High tides and wave action damaged the amusement centers, night clubs, a motel, the skating rink and beach cottages. Structural damage included undermining of buildings, damage to piling and flooding of some first floors. A pier was left sagging after the storm. Flooding of streets was reported as minor.

Damages are estimated at $100,000.

STORM DAMAGE IN NEW HAMPSHIRE

35. General. - The New Hampshire coast line received relatively little damage from the 29 December 1959 storm as compared with past northeasters. Shore protective structures at Hampton Beach were credited with saving of much damage in that resort area. The storm flooded some low areas and left coastal highways and roads littered with sand and debris. Some erosion and damage to sea walls and embankments occurred throughout the shore line.

A detailed description of damages from Seabrook north to Rye, with preliminary estimate of losses are included in the following paragraphs. See the accompanying map for locations where damages occurred, numbered in accordance with number of paragraphs containing description of damage.

36. Seabrook, New Hampshire. - High tides caused flooding of marshlands to the extent that water backflooded portions of the town to depths of 2 feet. Portions of main street were flooded and water rose over the floor in a lobster pound. The beach front of the town suffered little as a result of the storm.

Damages are estimated at $5,000.

37. Hampton, New Hampshire. - The Hampton Beach and North Beach areas suffered minor damage. There was some erosion of dunes along the southerly 100 feet of beach adjacent to the inlet at Hampton Beach. A small quantity of sand washed over the bulkhead and was deposited on the sidewalk. At North Beach, small amounts of shingle littered

sidewalks. The beach was covered with stones making it coarser than usual. Sand washed from the north end of the beach, exposing stone groins. A few stone blocks were displaced from groins and revetments. It was reported that the displacement could be partially attributed to other storms.

There was a small amount of damage caused by the flooding of cellars.

Damages are estimated at $25,000.

38. North Hampton, New Hampshire. - The shore front of North Hampton suffered little damage. The beaches and parking lots were littered with stones. A shingle ridge in the vicinity of Fox Hill Point had to be bulldozed level.

Damages are estimated at $5,000.

39. Rye, New Hampshire. - A considerable amount of stone displaced from a dry stone wall, some sand, gravel and debris on highway. No appreciable flooding reported.

Damages are estimated at $25,000.

STORM DAMAGE IN MAINE

40. General. - Most of the damage occurred in resort areas south of Portland and in the city of Portland. Little damage occurred north of this city. The hardest hit areas were Kennebunk, Kennebunkport, Biddeford, Saco and Portland. Flooding was the major cause of damage. Losses of bulkheads and erosion to the resort beaches occurred.

A detailed description of the damages from Ogunquit Beach north and preliminary estimates for losses are included in the following paragraphs. See the accompanying map for locations where damages occurred, numbered in accordance with number of paragraph containing description of damage.

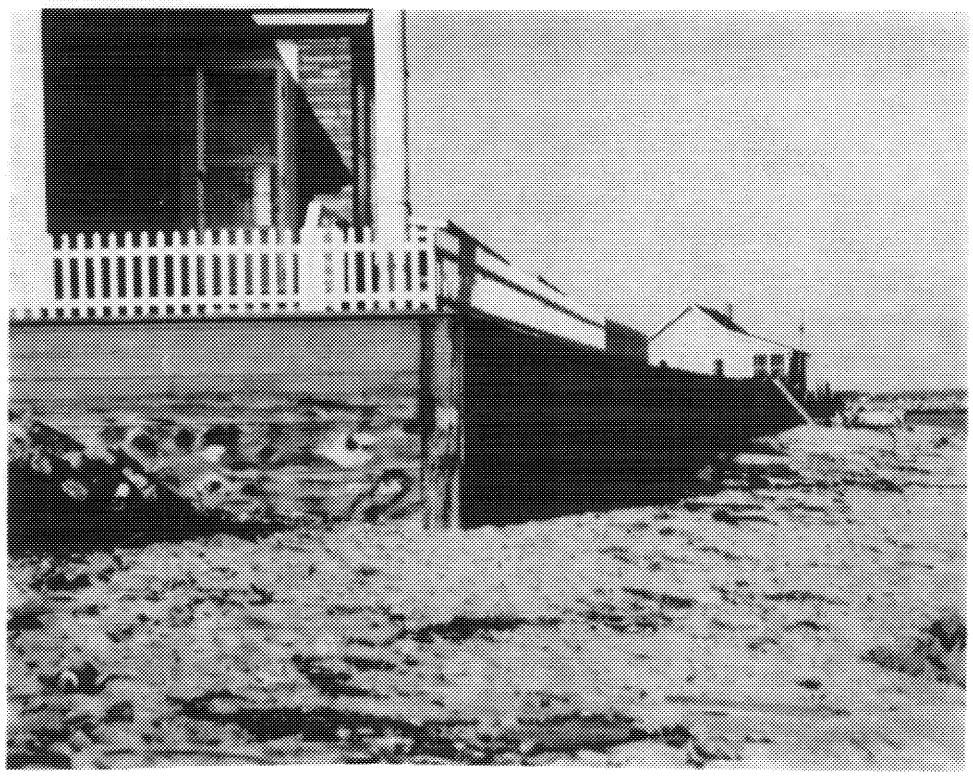
41. York, Maine. - Flooding of low lying roads occurred depositing small amounts of sand, gravel and debris. No apparent losses to the beach occurred. Investigation of the beach including the Short Sands area found it in good condition.

Damages are estimated at $5,000.

42. Wells, Maine. - Minor flooding of shore roads left small deposits of sand, gravel and debris on the highway. Private property lost a small amount of fill behind sea walls but walls remained in place. Shore front property had small deposits of sand on lawns but no homes suffered any apparent damage.

BIDDEFORD, MAINE. Timber bulkhead, at Hills Beach, destroyed by storm.

BIDDEFORD, MAINE. The storm destroyed bulkheads and allowed extensive erosion.



BIDDEFORD, MAINE. Sand line on bulkhead indicates loss of sand on Hills Beach.

BIDDEFORD, MAINE. Storm driven waters erode deeply into sand dunes on Hills Beach.

43. Kennebunk, Maine. - Considerable damage occurred here by flooding of shore front homes and lawns, destruction to a 61 foot length of rubble sea wall, 1/2 mile of sidewalk and 300 feet of timber bulkhead with some loss of fill. Up to 2 feet of sand, gravel and debris was deposited on some low lying shore roads.

Damages are estimated at $50,000.

44. Kennebunkport, Maine. - The town suffered considerable cellar flooding to about 60 homes with water on the first floor of a hardware store and three other business establishments. No town walls were lost but the Goose Rock area had considerable damage to sea walls with some summer homes subjected to flooding and sand deposits on lawns. This beach had some erosion.

Damages are estimated at $50,000.

45. Biddeford, Maine. - No appreciable flooding occurred within the commercial area of the town but shore front property at Hill's beach was flooded with 15 to 20 houses badly damaged by undermining and loss of porches. Three houses were washed away. Several hundred feet of bulkheads went out. An appreciable amount of erosion occurred.

Damages are estimated at $250,000.

46. Saco, Maine. - Camp Ellis, Ferry Beach and Biddeford Pool received the most damage. General flooding and undermining of shore front homes occurred and several houses were

SACO, MAINE. 15 to 20 cottages at Camp Ellis were undermined by storm waters. Three cottages were washed out to sea.

SACO, MAINE. High tides damaged stone revetments and eroded embankments along Ferry Beach area of Camp Ellis.

SACO, MAINE. Storm damaged streets along the beach front of Camp Ellis.

SACO, MAINE. Street surface and embankment damaged at Ferry Beach, Camp Ellis.

destroyed. A shore front road at Ferry Beach was eroded back several feet and several hundred feet of bulkhead was lost. Appreciable beach erosion occurred.

Damages are estimated at $100,000.

47. Old Orchard, Maine. - Received no major damage from this storm. Some flooding occurred to a few amusement stands at Old Orchard Beach and low lying roads were inundated and had small deposits of sand and gravel deposited. Bay View road to Higgins Beach was washed out and closed to traffic.

Damages are estimated at $25,000.

48. Cape Elizabeth, Maine. - Wave action deposited small amounts of sand, gravel, and debris on low lying roads. No major flooding within the area.

Damages are estimated at $5,000.

49. Portland, Maine. - Up to 3 or 4 feet of flooding occurred in the Portland Pier area with basement flooding in the commercial waterfront areas. In some cases water was on the street floors. Many sewers backed up causing damage to heating units and supplies. The passenger Ferry ramp at Great Diamond Island was torn away by the heavy seas.

Damages are estimated at $200,000.

50. Phippsburg, Maine. - The main damage was to the Coast Guard dock at Kennebec Mouth. Water was over the dock; electric power on pier was deluged and inoperative.

Damages are estimated at $5,000.

[illegible] shown on Plate No.

[illegible] The selection of [illegible]

PORTLAND, MAINE. High tides inundated Portland Pier.
Photo by Press Herald.

PORTLAND, MAINE. Automobiles were trapped as waters rose over Central Wharf. *Photo by Press Herald.*

51. Boothbay, Maine. - Wave action and flooding caused riprap failure at Coast Guard Station; a small wooden bridge collapsed on East Boothbay-Boothbay harbor road.

Damages are estimated at $25,000.

STORM DAMAGE AT FEDERAL PROJECTS

52. Navigation Projects. - Damages to breakwaters and shoaling of channels are not always apparent from a cursory inspection. The determination of the amount and extent of damages to navigation projects will require field surveys, which are to be made as a part of the next annual inspection for the regular maintenance program. It is reported that winter storms have caused damage to the breakwater at Sakonnet Harbor, Rhode Island; also that progressive damage is occurring to the breakwater at the Point Judith Harbor of Refuge in Rhode Island.

53. Beach Erosion Control Projects. - Beach fill improvements generally proved effective, although wave action associated with the storm was not particularly heavy. The recently completed concrete bulkhead and sand fill along Quincy Shore Beach, Massachusetts, provided full protection against overtopping and the beach remained in good condition after the storm. There has been no flooding of the boulevard and the adjoining developed area since completion of the project in 1959.

Winthrop Beach damages were not as great as experienced during previous major storms, partly due to the protection

[illegible] and the entire reservoir

afforded by beach fill, sea wall and breakwaters. At the south end of Winthrop Beach, Massachusetts, a section of stone coping recently added to the top of the existing sea wall was displaced by wave attack.

Revere Beach was overtopped, causing flooding of 200 homes and commercial establishments. Moderate wave action damaged several "Mother's Rest" beach shelters. Only about one-third of the sand fill recommended in the authorized Federal project for beach widening has been placed. For this reason the effectiveness of the project in eliminating or reducing damages is not apparent.

There was no serious damage at Hampton Beach, New Hampshire. Sand was carried over the beach onto the shore boulevard and parking areas.

Winter storms have overtopped and severely eroded Misquamicut Beach and other points along the Rhode Island shore. The storm of 29 December 1959 was not particularly severe in Rhode Island, or Connecticut. The observed erosion is attributable to other winter storms.

OTHER DAMAGES

54. General. - There have been no reports of major damage to boats, marinas or to the fishing industry.

ESTIMATE OF STORM DAMAGES

55. A recapitulation of estimated damages for the 29 December 1959 storm is given below.

Massachusetts	
Cape Cod	$ 100,000
Plymouth	20,000
Duxbury	25,000
Marshfield	110,000
Scituate	290,000
Cohasset	5,000
Hull	930,000
Hingham	5,000
Weymouth	70,000
Braintree	1,000
Quincy	750,000
Boston	1,000,000
Chelsea	10,000
Winthrop	250,000
Revere	1,000,000
Saugus	100,000
Lynn	200,000
Nahant	100,000
Swampscott	5,000
Marblehead	50,000
Salem	100,000
Gloucester	10,000
Newburyport	15,000
Salisbury	100,000
*Other Damages	54,000
	$5,300,000

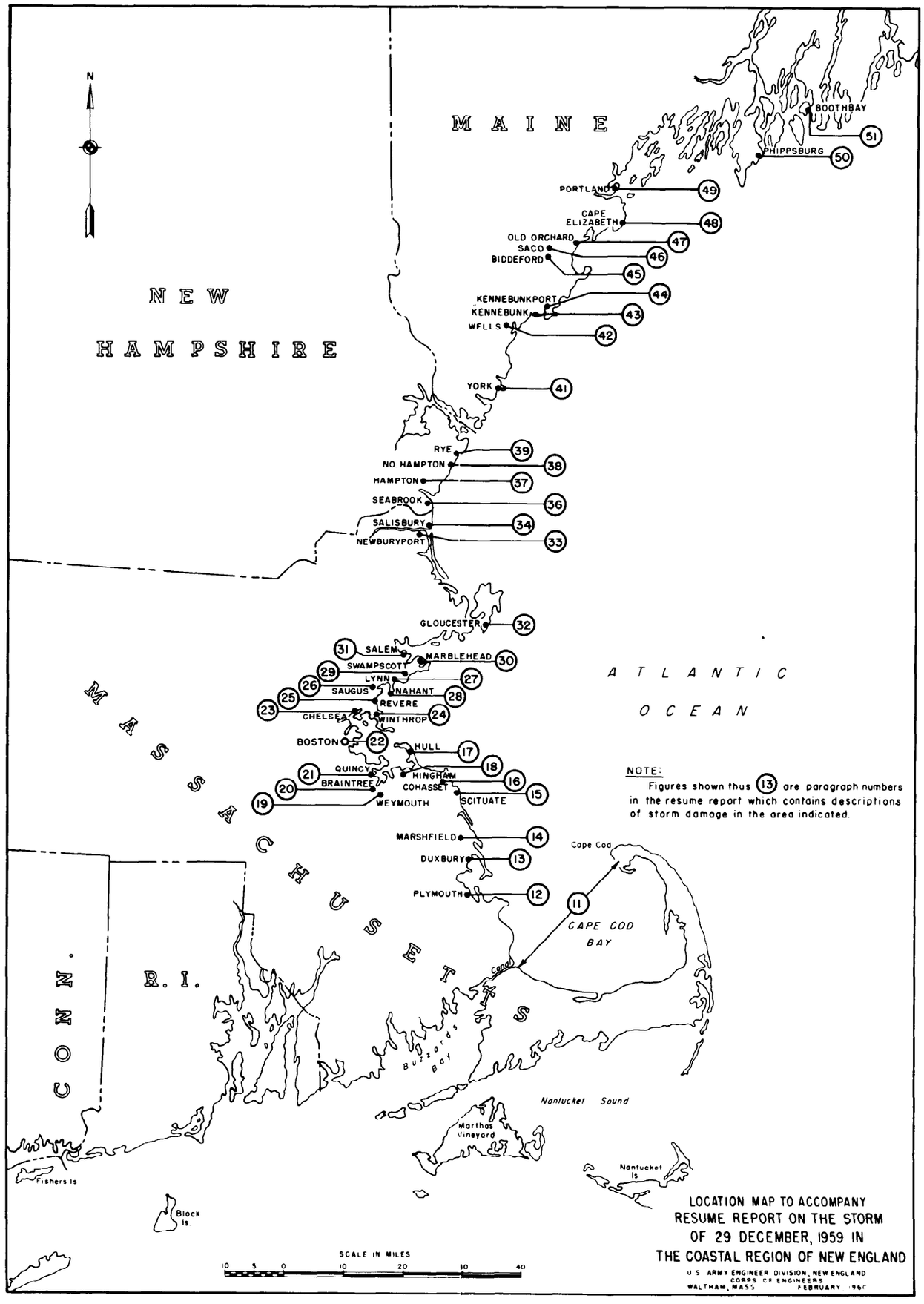
New Hampshire	
Seabrook	$ 5,000
Hampton	25,000
North Hampton	5,000
Rye	25,000
*Other Damages	40,000
	$100,000

Maine	
York	5,000
Wells	5,000
Kennebunk	50,000
Kennebunkport	50,000
Biddeford	250,000
Saco	100,000
Old Orchard	25,000
Cape Elizabeth	5,000
Portland	200,000
Phippsburg	5,000
Boothbay	25,000
*Other Damages	80,000
	$800,000

TOTALS

Massachusetts	$5,300,000
New Hampshire	100,000
Maine	800,000
Total:	$6,200,000

*Boats, fishing industry, miscellaneous items



NOTE:
Figures shown thus (13) are paragraph numbers in the resume report which contains descriptions of storm damage in the area indicated.

LOCATION MAP TO ACCOMPANY
RESUME REPORT ON THE STORM
OF 29 DECEMBER, 1959 IN
THE COASTAL REGION OF NEW ENGLAND

U S ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS. FEBRUARY 1960